

The Importance of Scientific Creativity for Students on Science Learning

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Abstract: *Scientific creativity is a way of thinking that is emphasized in scientific or scientific activities. Scientific creativity is an important aspect of the goals of science learning in 21st century learning and the demands of the 2013 curriculum are realized or achieved during science learning. Scientific creativity is needed as a provision for life. To anticipate developments in the era of globalization, it is necessary to improve the quality of education in Indonesia, one of which is the implementation of the 2013 Curriculum as an effort to prepare graduates who have the attitude of knowledge and various skills, including scientific creativity. Therefore it is necessary to develop innovative models to improve the scientific creativity of junior high school students in science learning.*

Keywords: *Creative thinking, learning, scientific creativity, science learning, students.*

Date of Submission: 20-06-2019

Date of acceptance: 04-07-2019

I. Introduction

Creativity is a mental process that involves the emergence of new ideas or concepts, or new relationships between existing ideas and concepts. Creativity is very required to exist in students, students and creativity cannot be separated from each other. During this time we know that students have a big role in the movement of change in this nation, this cannot be separated from the attitude of students' creativity.

Students are prospective leaders of the nation must have the mindset like an adult who sees the future especially for the country. To change the nation, students need to turn their brains to develop their abilities in all things. Actually many students have opportunities and opportunities to create and innovate. Student organizations are even able to develop students' abilities to become increasingly complex, both in terms of actions, and mindsets. This is intended to support an increase in the level of students in seeing everything that exists.

As we have seen, there are 5 circles of creativity, namely: (1) Existential, namely how to create something that has never been there to exist. (2) Relational / Communicational namely how to convey existential creative, so that the creativity can be known by others. (3). Instrumental is how we can create a creation that if used by others, the benefits can be felt and make it creative. (4). Orientation is the creation of creativity in the previous levels to be beneficial for the whole community. (5). Innovational which means creating new creativity or innovation.

The biggest problem faced by students actually comes from within these students, the willingness to develop abilities in creative terms that really supports the increase in creativity of the students themselves. Willingness in a person cannot be forced. Without will, many things will stagnate and may not be implemented. Another supportive problem is laziness, laziness is indeed a big enemy of humans, many people are lazy to put out creative ideas in themselves, not just lazy to issue ideas, maybe even people tend to be lazy to be creative. This is what prevents people from being creative. The third is that the mindset of students is too raw and "straight", students now tend to think that is too fixed on something, the mind will usually familiarize students not to widen and expand their views on things that exist, so creativity will be hampered.

Education in Indonesia is growing year by year. This requires the teacher to always develop the potential of students and maximize learning^[1]. In the process of learning students cannot be separated from debriefing thinking activities such as logical thinking, analytical, systematic, critical, and creative, as well as the ability to cooperate. Examples of creativity on how to record that tend to be exactly the same as those in learning media. In fact, students may not be exact in taking notes or other scientific activities. Furthermore^[2] states that the ability to think logically, analytically, systematically, critically and collaboratively in Mathematics is more often developed. However, there have not been many efforts to develop creative thinking. Though these abilities are very necessary for future life in students such as obtaining, managing and utilizing information^[2].

Thinking according to ^[2] is a mental activity carried out by someone if they are in a situation or problem to be solved. Some types of thinking activities are logical, analytical, systematic, critical, and creative thinking. The last two types of thinking, critical and creative thinking, are categorized as high-level thinking or what is called higher order thinking. High-level thinking is a thought process that is able to connect, manipulate, and transform the knowledge and experience that has been owned to solve a problem ^[3]. Often critical and creative thinking is related. Critical thinking is the ability to think of students to compare two things or more information which if there are differences or similarities he will ask questions to get an explanation ^[3].

Creative thinking or also often called divergent thinking, is the ability to generate new ideas that develop into several possible solutions to solve a problem. According to ^[4] states that "Creativity is the ability to produce original work and ideas. From these various opinions it can be concluded that creative thinking is a mental ability to produce something unusual, new ideas or a combination of old ideas with new ideas.

The development of creative thinking processes includes introducing different phases or characteristics. Some popular models are Wallas and Torrance models. Wallas ^[4] categorizes the four phases of creative thinking, namely preparation, incubation, illuminations (when new ideas arise), and verification (ensuring new ideas). It's different with Torrance. He categorizes the characteristics of creative thinking as abilities of originality, fluency, flexibility and elaboration. The four characteristics are known as TTCT (Torrance Test of Creative Thinking). As the development of creative thinking, ^[5] introduces scientific creative thinking. So far not much research has focused on scientific creative thinking skills. In this article the focus will be discussed in relation to: (1) Scientific Creativity, (2) The importance of scientific creativity for students, (3) Scientific Creativity Assessment Instrument.

II. Discussion

2.1 Scientific Creativity

As the development of creative thinking, ^[5] introduces scientific creative thinking. So far not much research has focused on scientific creative thinking skills. Scientific creative thinking is a way of thinking that is emphasized in scientific or scientific activities ^[6]. Scientific creative thinking has its own characteristics besides referring to the characteristics of creative thinking in general, namely Torrance (fluency, flexibility, and originality). The characteristics in question are the dimensions that a person needs to produce a product.

According to ^[7], the dimensions of creative thinking include product dimensions, traits dimensions, and process dimensions. These three dimensions are used to measure students' creative scientific thinking skills. The seven scales of scientific creativity measurement mentioned above are (1) skills to develop scientific knowledge creatively (advances science knowledge), (2) skills to develop creative experiments (creative experimental abilities), (3) skills to understand phenomena (understanding science phenomena), (4) science problem solving skills with various creative solutions (science problem solving), (5) skills to make creative questions to solve science problems (6), the ability to improve the quality of a scientific product (technical product), and (7) the ability to design a creative new product (creative science product design ability) ^[8].

2.2 The Importance of Scientific Creativity for Students in Science Learning

In this life creativity is very important, because creativity is an ability that is very meaningful in the process of human life. Creativity is not just luck but is realized hard work. The failure for creative people is only a confounding variable for success. He will try again, and try again until it works. People who are creative use the knowledge that we all have and make a leap that makes it possible, they see things in new ways. Gordon Dryden in the Revolutionary Learning book says that, "An idea is a new combination of old elements. There are no new elements. Only new combinations exist."

Creativity is creativity and the ability to create things from nothing to exist. Usually, creativity will bring innovation, namely the ability to renew things that already exist. If creativity is power or ability, then innovation is the result or product. In the book psychology and life written by Richard J. Gerri G, and Philip G. Zimbardo, it was written that before we leave the area of intelligence and its assessment, we wish to turn to the topic of creativity. Sternberg & Lubart stated that the creativity of individual's ability to generate novel and appropriate circumstances in which they were generated. Consider the invention of the wheel. The device was novel because no one before the unknown inventor had seen the application of rolling objects. It was appropriate because the use to which the novel object could be put was very clear. Without appropriateness, new ideas objects are often considered strange or irrelevant ^[1].

Creativity is so important in human life. Why? Without creativity we will dissolve and crush the wheel of change. Without creativity we will not be able to survive the increasingly rapid changes. Basically, we are all creative. As long as humans can think well, they are creative. Creative is nothing more than a process of thinking in producing something. Producing does not mean that from nothing to existing, we can produce new forms, new formats, new materials, etc. that are "new". Some even say that creativity is a journey to find something that has not been discovered by others.

According to experts, someone who is creative always sees things differently and new, and is usually not seen by others. Creative people, who generally know the problem very well and discipline, can usually do something deviating from traditional methods. The process of creativity involves the presence of new ideas, useful, and unexpected but can be implemented.

Today almost everyone from lay people, leaders of educational institutions, company managers to government officials talk about the importance of creativity being developed in schools, being sued for work, and needed for development. It must be admitted that it is indeed difficult to determine an operational definition of creativity, because creativity is a pluralistic and multi-dimensional concept.

Nowadays creativity is in the spotlight of various parties, especially in the world of education. Based on the results of a study conducted by Hans Jellen of the University of Utah US and Klaus Urban from the University of Hannover in August 1987 for students aged 10 years with a sample of 50 students in Jakarta, the results were very surprising. It turns out that students' learning creativity in Indonesia is very low compared to other countries.

In fact, creativity in learning is very important for the development of students because it has a big influence on the totality of one's personality. According to Andang Ismail, it was explained that creativity can be a power that moves people from those who do not know to know, cannot become capable, stupid to be intelligent, passive to be active, and so on. by the government with the improvement of the education curriculum that focuses more on the activeness of students in learning so that it can develop students' learning creativity. However, implementation in schools is still very alarming. Learning still tends to inhibit the growth and development of student learning creativity. A concrete example is an evaluation system that emphasizes correct and incorrect answers without regard to the process.

If the teacher tries to improve creativity, besides the teacher must be able to activate students in learning, it must also create an interesting learning atmosphere for students. In accordance with the atmosphere like this, students besides being able to hone their cognitive abilities, also get direct experience, so that learning becomes more meaningful for students. Meaningful learning allows students to discover facts and concepts themselves and develop the values demanded.

Scientific creativity is an important aspect of the goals of science learning in 21st century learning and the demands of the 2013 curriculum are realized or achieved during science learning. Scientific creativity is needed as a provision for life. To anticipate developments in the era of globalization, it is necessary to improve the quality of education in Indonesia, one of which is the implementation of the 2013 Curriculum as an effort to prepare graduates who have the attitude of knowledge and various skills, including scientific creativity. This was stated in Permendikbud No. 68 of 2016 concerning the structure of the SMP / MTs curriculum that the competencies that must be achieved by SMP / MTs students through science learning include scientific creativity. Therefore it is necessary to develop innovative models to improve the scientific creativity of junior high school students in science learning.

2.3 Scientific Creativity Assessment Instrument

Scientific creative thinking has its own characteristics besides referring to the characteristics of creative thinking in general, namely Torrance (fluency, flexibility, and originality). The characteristics in question are the dimensions that a person needs to produce a product. According to Hu and Adey (2010), the dimensions of creative thinking include product dimensions, traits dimensions, and process dimensions. These three dimensions are used to measure students' creative scientific thinking skills. If depicted, the three dimensions form Science Structure Creativity Model (SSCM) like Figure 1.

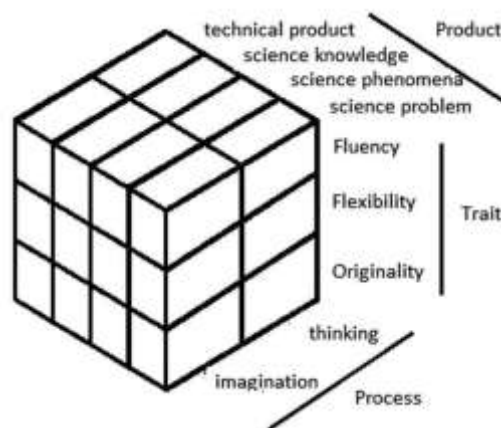


Figure 1. Science Structure Creativity Model (SSCM)^[5].

[7,8] examined the development of scientific creative thinking tests and their validity for junior secondary students. 160 students in the UK took the test. In the study indicated that scientific creative thinking skills increased with increasing age and scientific abilities needed but adapted to their conditions. [9] develops scientific creative thinking and validity for 5th grade students at the elementary school level with a Problem Based Learning model.

The study yielded results that students' scientific skills increased marked by increasingly fluent, flexible, and original. When students are trained in these three characteristics to solve problems, they are encouraged to be more creative in terms of science activities. [10] carried out the development of scientific creative thinking through FSCT (Figural Scientific Creativity Test) based on SSCM construction for preschool students. The results of the study showed a high level of reliability, proper validity to measure the scientific creative thinking skills of preschool students.

III. Conclusion

Scientific creative thinking is a way of thinking emphasized in scientific or scientific activities. Scientific creativity is an important aspect of the goals of science learning in 21st century learning and the demands of the 2013 curriculum are realized or achieved during science learning. Scientific creativity is needed as a provision for life. To anticipate developments in the era of globalization, it is necessary to improve the quality of education in Indonesia, one of which is the implementation of the 2013 Curriculum as an effort to prepare graduates who have the attitude of knowledge and various skills, including scientific creativity. This was stated in Permendikbud No. 68 of 2016 concerning the structure of the SMP / MTs curriculum that the competencies that must be achieved by SMP / MTs students through science learning include scientific creativity. Therefore it is necessary to develop innovative models to improve the scientific creativity of junior high school students in science learning.

References

- [1]. Lailiyah, Qiftiyatul & Suliyannah. 2018. Profil Keterampilan Berpikir Kreatif Ilmiah Siswa Pada Materi Momentum Dan Impuls Kelas XI SMA Negeri 1 Tarik Sidoarjo. *Jurnal Inovasi Pendidikan Fisika* Vol. 07 No. 0147-50.
- [2]. Siswono, Tatag Y. E. 2007. "Meningkatkan Kemampuan Berpikir Kreatif Siswa Melalui Pengajuan Masalah dan Pemecahan Masalah Matematika." Makalah disampaikan pada Simposium Nasional Penelitian Pendidikan (Pusat Studi Kebijakan Departemen Pendidikan Nasional), Jakarta, 25-26 Juli 2007.
- [3]. Rofiah, Eni. dkk. 2013. "Penyusunan Instrumen Tes Kemampuan Berpikir Tingkat Tinggi Fisika pada Siswa SMP." *Jurnal Pendidikan Fisika*, Vol. 1, No.2, 17-22.
- [4]. Kanematsu, H and M. Barry, D. 2016. "Chapter 2: Theory of Creativity." *Journal Springer*. Page 9-12. (<http://www.springer.com/978-3-319-19233-8>, diunduh pada 4 Agustus 2016).
- [5]. Hu, W. & Adey, P. (2010). A scientific creativity test for secondary school students. *International Journal of Science Education*, 24(4), 389-403.
- [6]. Suyidno. 2017. "Membangun Kreativitas Ilmiah dan Tanggung Jawab Generasi Emas Indonesia." Seminar Umum Mengenai Keterampilan Berpikir Kreatif Ilmiah di Jurusan Fisika FMIPA Universitas Negeri Surabaya, Surabaya, 31 Maret 2017.
- [7]. Hu, W., Shi, Q. Z., Han, Q., Wang, X., & Adey, P. (2010). Creative scientific problem finding and its developmental trend. *Creativity Research Journal*, 22(1), 1-7.
- [8]. Hu, W., Wu, B., Jia, X., Yi, X., Duan, C., & Meyer, W. (2013). Increasing student's scientific creativity: The "learn to think" intervention program. *The Journal of Creative Behavior*, 47(1), 3-21.
- [9]. Siew, N. M., dkk. 2015. "Fostering Fifth Graders' Scientific Creativity Through Problem Based Learning." *Journal of Baltic Science Education*, Vol. 14, No. 5, Page 655-669.
- [10]. Chin, M. K., and Siew, N. M. 2015. "The Development and Validation of a Figural Scientific Creativity Test for Preschool Pupils." *Creative Education*, 6, 1391-1402.

Rizqi" The Importance of Scientific Creativity for Students on Science Learning" *IOSR Journal of Research & Method in Education (IOSR-JRME)* , vol. 9, no. 3, 2019, pp. 12-15.